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INTERNATIONAL SEARCH REPORT

International application No.

PCT/SE 98/02396

A. CLASSIFICATION OF SUBJECT MATTER

IPC6: H04Q 7/38

According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC6: H04Q

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
X	The GSM System for Mobile Communication M. Mouly et al 1992 see page 399-412 and page 363 --	1-2
P,A	WO 9832304 A1 (NOKIA TELECOMMUNICATIONS OY), 23 July 1998 (23.07.98), page 5, line 8 - page 9, line 26; page 13, line 30 - page 16, line 9 --	1
E	WO 9859468 A2 (NOKIA TELECOMMUNICATIONS OY), 30 December 1998 (30.12.98), page 5, line 20 - page 6, line 22; page 6, line 23 - page 13, line 21 -- -----	

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

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Information on patent family members

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Patent document cited in search report			Publication date	Patent family member(s)		Publication date
WO	9832304	A1	23/07/98	AU	5665998 A	07/08/98
				FI	3025 U	15/08/97
				FI	970238 A,V	21/07/98

WO	9859468	A2	30/12/98	AU	7920998 A	04/01/99
				FI	972725 A	25/12/98

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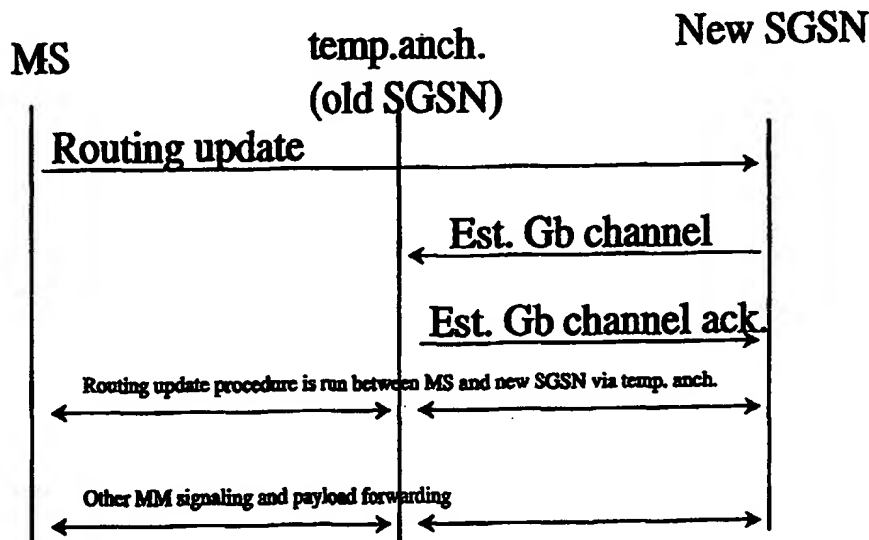
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(21) International Application Number: PCT/SE98/02396 (22) International Filing Date: 18 December 1998 (18.12.98) (30) Priority Data: 19976150 30 December 1997 (30.12.97) NO (71) Applicant: TELEFONAKTIEBOLAGET LM ERICSSON (publ) [SE/SE]; S-126 25 Stockholm (SE). (72) Inventors: BAKKE, Knut; Strömsbu Terrasse 13, N-4800 Arendal (NO). HOLEN, Björn; Botteråsveien 11, N-4800 Arendal (NO). (74) Agent: ERICSSON RADIO SYSTEMS AB; Common Patent Dept., S-164 80 Stockholm (SE).		(81) Designated States: AL, AM, AT, AU, AZ, BA, BB, BG, BR, BY, CA, CH, CN, CU, CZ, DE, DK, EE, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MD, MG, MK, MN, MW, MX, NO, NZ, PL, PT, RO, RU, SD, SE, SG, SI, SK, SL, TJ, TM, TR, TT, UA, UG, UZ, VN, YU, ZW, ARIPO patent (GH, GM, KE, LS, MW, SD, SZ, UG, ZW), Eurasian patent (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European patent (AT, BE, CH, CY, DE, DK, ES, FI, FR, GB, GR, IE, IT, LU, MC, NL, PT, SE), OAPI patent (BF, BJ, CF, CG, CI, CM, GA, GN, GW, ML, MR, NE, SN, TD, TG). Published <i>Without international search report and to be republished upon receipt of that report.</i>	

(54) Title: **METHOD FOR IMPROVING THE HANDING OVER A CONNECTION FROM ONE SGSN TO ANOTHER SGSN**



(57) Abstract

The present invention relates to a method for improving the handing over of a connection from one SGSN (I) to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another, and for the purpose of not interrupting the packet transmission and possible layer 3 procedures, and for optimizing the network utilization without adding complexity to SGSN, it is according to the invention suggested that at inter SGSN routing update, the old SGSN (I) is given the role as a temporary anchor whereas the other (new) SGSN (II) is temporarily working as a serving SGSN.

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METHOD FOR IMPROVING THE HANDING OVER A CONNECTION FROM
ONE SGSN TO ANOTHER SGSN

5 Field of the invention

The present invention relates to a method for improving
the handing over of a connection from one SGSN to an-
other, i.e. when an MS (Mobile Station) moves from one
10 SGSN service area to another.

Background of the invention

15 More specifically the present invention relates to GPRS
service on GSM.

When a mobile station (MS) in active GPRS modus, i.e.
transmitting information, moves from one SGSN service
20 area to another, the packet transmission and possible
layer 3 procedures should not be interrupted.

Due to the complex state machines for the layer 3 proce-
dures, changing SGSN directly implies transmitting very
25 large amounts of control data from one SGSN to another.
Another problem is ongoing transactions with other net-
work nodes which also has to be redirected to the new
SGSN.

30 **State of the art**

GSM voice service uses an anchor concept to solve the
problem. That means that in the network node (MSC/VLR) a
connection is primarily established and is kept through-
out the whole call. This node is entitled 'anchor
35 MSC/VLR'. If the subscriber moves into another MSC/VLR's
coverage area, the new MSC/VLR acts only as a transit
node. This node is entitled 'serving MSC/VLR' whereas the

connection control still resides in the anchor MSC/VLR throughout the call.

Problems related to prior art

- 5 GPRS has no working solution on this problem yet. Due to the long connection times for GPRS (hours) compared to a circuit switched connection (minutes), a similar solution for GPRS may result in a great number of anchor-serving legs.

10

Objects of the invention

- 15 An object of the present invention is to provide a method for improving the handing over of a connection from one SGSN to another, whereby the packet transmission and possible layer 3 procedures are not interrupted.

- 20 Another object of the present invention is to provide such a method by which the layer 3 procedures do not have to be designed for supporting inter SGSN routing update.

- 25 Still another object of the present invention is to provide a method by which the risk of losing payload packets is minimized.

- 30 Yet another object of the present invention is to provide a method by which the tunnelling of payload packets from one SGSN to another is not required, thereby simplifying the design necessary therefor.

- Still another object of the present invention is to provide a method which optimizes the network utilization without adding complexity to SGSN.

35

Another object of the present invention is to provide a method by which the service degradation when handing over a

connection from one SGSN to another is minimized as experienced from the MS point of view.

5 Brief disclosure of the invention

In a method as stated in the preamble, the above objects are achieved by the features as stated in the enclosed patent claims.

10

In other words, the present method suggests that at inter SGSN routing update, the old SGSN gets the role as a temporary anchor whereas the new SGSN works temporarily as a serving SGSN. This leg is kept as long connection control
15 procedure are processing including data packet transmission. When all activities have ceased for the connection, i.e. no data transmission, no layer 3 procedures and no on-going transactions towards other networks nodes, the connection control is moved from anchor to serving SGSN.

20

The leg between anchor and serving SGSN is a Gb interface with minor modifications. Some control signalling is required to handle radio resources.

25 Further advantages and features of the present method will appear from the following description taken in conjunction with the appending drawings, as well as from the enclosed patent claims.

30

Brief disclosure of the drawings

Fig. 1 and Fig. 2 are signalling sequence layouts, illustrating the principle of how inter SGSN routing update is
35 carried out in two steps.

Description of embodiments

As explained in the preamble, the present invention relates to a method method to "hand over" a connection from one SGSN to another without interrupting packet transmission and control signalling. The method allows the network to create a temporary leg between the old and the new SGSN. The temporary leg prevails until the state of the connection in the anchor SGSN can be securely transferred to the new SGSN while at the same time redirecting packet transfer to go directly from/to SGSN to/from the new SGSN.

With reference to Fig. 1 and Fig. 2 it is illustrated by means of a signalling sequence how the principle of inter SGSN routing update is carried out in two steps.

This construction has the advantage of not impacting ongoing layer 3 procedures and any payload transmission. Actually, the layer 3 procedures do not have to be designed to support inter SGSN routing update since the temporary Gb channel is not visible for layer 3. Today's solution in GPRS require that all layer 3 procedures must be designed to cater for an inter SGSN routing update.

Since the context take-over from temp. anchor to new SGSN takes place when the connection has entered a standby state, the risk for losing payload packets is minimised. And since there is no traffic ongoing, the tunnelling of payload packets from temp. anchor to new SGSN is not required, thereby simplifying the design.

The temp. anchor principle also simplifies signalling to between SGSN and external nodes. Since the solution allows the connection to finish up ongoing transactions before moving the context to new SGSN, services such as

charging may be completed towards billing gateway in the normally manner before the context is moved to the new SGSN and charging is resumed.

5 **Merits of invention**

The solution optimises the network utilisation without adding complexity to SGSN. The subscriber will not experience any loss of service i.e., no retransmission peer to peer and no interrupted layer 3 procedures.

10

List of Abbreviations

GPRS - General Packet Radio Service

15 SGSN - Serving GPRS support node

GGSN - Gateway GPRS support node

MSC/VLR - Mobile Switching Centre/Visitor Location Register

P a t e n t c l a i m s

1. Method for improving the handing over of a connection from one SGSN (I) to another, i.e. when an MS (Mobile Station) moves from one SGSN service area to another,
c h a r a c t e r i z e d i n t h a t at inter SGSN routing update, the old SGSN (I) is given the role as a temporary anchor, whereas the other (new) SGSN (II) is temporarily working as a serving SGSN.
2. Method as claimed in claim 1,
c h a r a c t e r i z e d i n t h a t at said inter SGSN routing update there is created a temporary leg between the old SGSN (I) and the new SGSN (II), said temporary leg being allowed to prevail as long as connection control procedure is upheld, including data packet transmission.
3. Method as claim in claim 1 or 2,
c h a r a c t e r i z e d i n t h a t the temporary leg is allowed to prevail until the state of the connection in the anchor SGSN (I) can be securely transferred to the new SGSN (II), while at the same time redirecting packet transfer to go directly from/to SGSN (I) to/from the new SGSN (II).
4. Method as claimed in claim 3,
c h a r a c t e r i z e d i n t h a t connection control is moved from said anchor SGSN (I) to said serving SGSN (II) when all activities for the connection have ceased, i.e. when no data transmission, no layer 3 procedure and no on-going transactions towards other network nodes prevail.
5. Method as claimed in any of the preceding claims,

c h a r a c t e r i z e d i n that the leg between the anchor SGSN (I) and the serving SGSN (II) is created as a Gb interface with minor modifications.

- 5 6. Method as claimed in any of the preceding claims,
c h a r a c t e r i z e d i n that the inter SGSN
routing update is carried out in a two step signalling
sequence, and then without impacting on-going layer 3
procedures and any payload transmission, said temporary
10 Gb channel not being visible for said layer 3.

7. Method as claimed in claim 6,
c h a r a c t e r i z e d i n that said signalling is
carried out between SGSN and external nodes, allowing the
15 connection in question to finish on-going transactions
before moving the context to a new SGSN (II), services
such as charging being completed towards billing gateway
in a normal manner before the context is moved to the new
SGSN (II) and charging resumed.

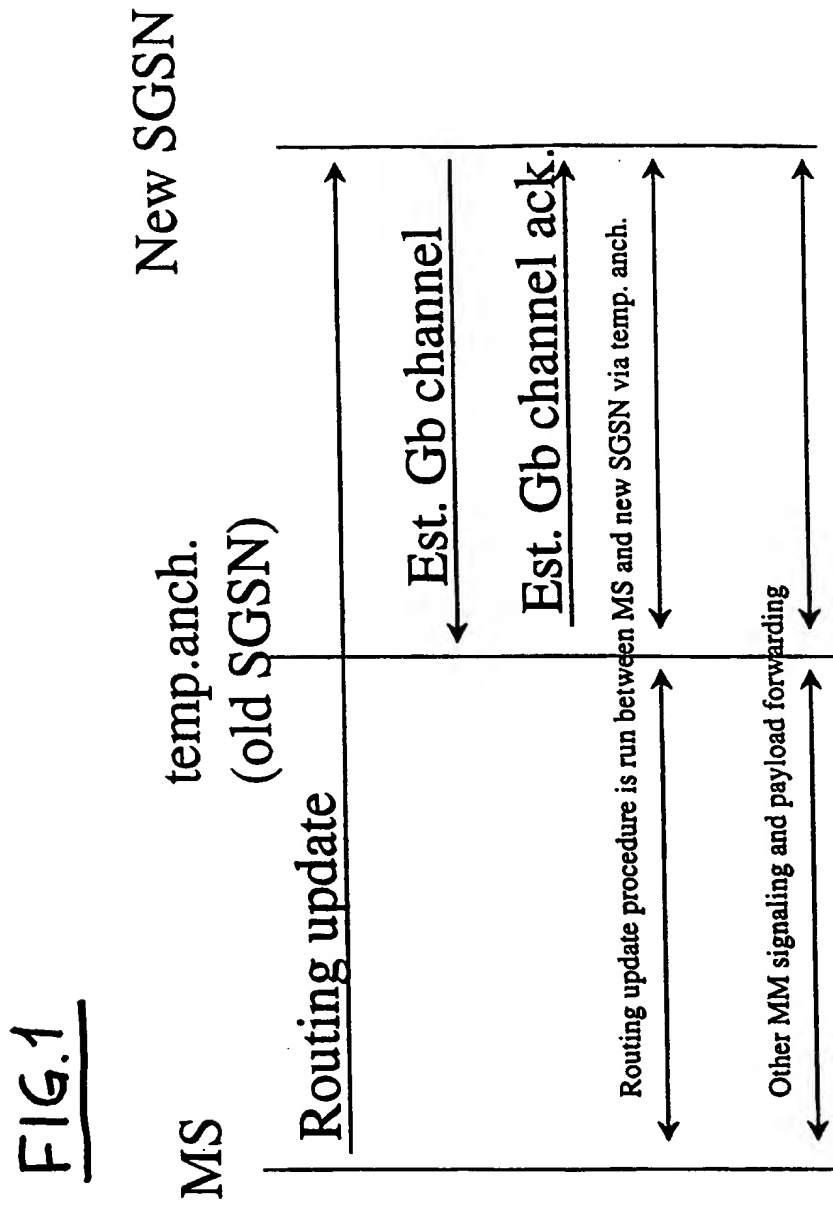
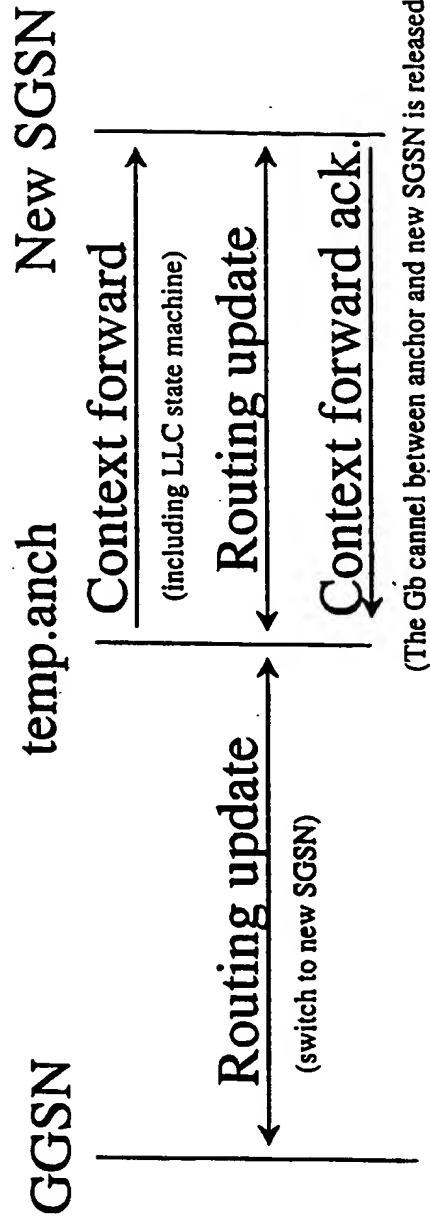


FIG. 2

When the connection enters standby state and no layer 3 procedures are ongoing the following procedure apply



(The Gb channel between anchor and new SGSN is released)